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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/555,713	10/20/2006	Martin Hausner	BEET-14	9725
26875 7590 06/30/2011 WOOD, HERRON & EVANS, LLP 2700 CAREW TOWER 441 VINE STREET CINCINNATI, OH 45202				
EXAMINER				
PHAM, THANH V				
ART UNIT		PAPER NUMBER		
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/555,713

Applicant(s)

HAUSNER ET AL.

Examiner

THANH V. PHAM

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 May 2011.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 18 and 20-32 is/are pending in the application.
- 4a) Of the above claim(s) 30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 18 and 20-29 and 31-32 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-940)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB-08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Response to Amendment

Claim Rejections - 35 USC § 103

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
2. Partial limitation of canceled claim 19 and deleted limitations in claim 24 are now incorporated in claim 1; the rejections are substantially maintained as in previous office action and alternated as below.
3. Claims **18**, 20-29 and 31-32 are rejected under 35 U.S.C. 103(a) as obvious over applicant's admitted prior art in combination with Schiller WO 01/000523 A1 (provided by applicant), Tomonari et al. EP 0 599 364 A2 (provided by applicant) and US Pub. 2003/0118076 A1 (herein after '076) and/or US 6,294,787 B1 (herein after '787), both, to Schieferdecker et al.

Re claim **18**, the applicant's admitted prior art discloses in instant fig. 11 a radiation sensor comprising:

a support 111 comprising silicon and/or GaAs and/or a semiconductor material; ~~Re claim 19, in the combination, the applicant's admitted prior art discloses~~ the support 111 has a rectangular and particularly a square contour.

a cavity 112 which may be a recess or a through hole formed in one surface of the support 111;

a dielectric membrane 113 provided on the one surface of the support 111;

a radiation sensor element 114 formed above the cavity 112;

electric terminals 115 for the sensor element 114, characterized in that:
the side wall of the cavity 112 is essentially orthogonal to the support surface.

the radiation sensor of fig. 11 would have the same size as of the improved claimed invention radiation sensor in fig. 1.

The applicant's admitted prior art discloses substantially all of the claimed invention.

The applicant's admitted prior art does not disclose the cavity in the surface of the support has a round or oval contour, the cavity is formed through dry etching, and an etching stop layer is formed on the one surface of the support between the one surface of the support and the dielectric membrane.

The Schiller reference discloses

"the devices ... are not limited to, pressure sensors, vibration sensors, accelerometers, gas or liquid pumps, flow sensors, resonant devices, and infrared detectors" (abstract);

page 3 discloses an etch such that "each 50 μm variation in wafer thickness will result in about 30 μm variation in the finished position of the mechanical feature at the front";

page 8 teaches both wet or dry etching techniques can be used to form the void with the sacrificial material 30 formed in between the diaphragm and the substrate body as an etching stop layer;

page 14 discloses "the conductive layers 252a and 252b are preferably configured to efficiently excite the fundamental vibration mode of the diaphragm layer 240 suspended over the void 270".

The Tomonari et al. reference discloses in col. 10

"the thermally infrared absorbing film 13G is initially form on one surface of the silicon substrate 12G with a silicon oxide film or a multilayered film of silicon oxide

film and silicon nitride film, ... In order to reduce the internal stress of this thermally infrared absorbing film 13G, it is preferable to adopt a multilayered structure of holding the silicon oxide film of 5,000 Å thick between both upper and lower silicon nitride films of 500 Å thick, i.e., a sandwich structure of the films"

"the thermistor is formed into a square of 2x2 mm through the patterning ..."

Tomonari et al.'s fig. 46 and the corresponding passage in col. 15, lines 10-18 discloses the thermally infrared absorbing multilayered film of nitride/oxide/nitride of silicon. Fig. 57 discloses a "rounded at respective corners" cavity and fig. 59 discloses a rounded corners or circular cavity; fig. 63 discloses an unnamed element on top of element 18R that could be considered as lens or mirror, and a 'housing' 18R. The lowest layer of the multilayered dielectric film disclosed by Tomonari et al. could be considered as the etching stop layer being "formed on the one surface of the support between the one surface of the support and the dielectric membrane".

Both Schieferdecker et al. references disclose different shapes of the cavity in formed sensor device.

It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the structure of applicant's admitted prior art with different shapes of the cavity with round or oval contour to "prevent the distortion and damage which likely to occur at corner portions" as taught by Tomonari et al. (col. 15, lines 45-57, different shapes for the cavity are well known to those skilled in the art) and an etching stop layer "in order to reduce the internal stress" (Tomonari et al.'s col. 10).

In the combination, the Tomonari et al. reference discloses further in col. 10 "the thermistor is formed into a square of 2x2 mm through the patterning ..."; a

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radiation sensor of applicant's admitted prior art has the following dimensions:

"[t]ypically the dimensions of the sensor elements include edge lengths of a few millimeters, cavity diameters of 50-90 % of the edge lengths of the sensor elements and membrane thickness of a few micrometers", "the fabrication of deep cavities (depth $T > 200 \mu\text{m}$)" (instant specification's page 1, lines 27-30 and page 3, line 10, respectively.) Further, improving from instant prior art fig. 11, claimed invention radiation sensor in fig. 1 would have the same size as of the radiation sensor of fig. 11.

Re claim 20, in the combination, a radiation sensor according to claim 19, characterized in that one or more electric terminals are provided in a corner section of the sensor (applicant's admitted prior art's 115a, 115b; Schieferdecker et al. '076, fig. 7/55,57, e.g.).

Re claim 21, in the combination, a radiation sensor according to claim 18, characterized in that the sensor element is a thermopile (Schieferdecker et al. '076, [0052], e.g.).

Re claim 22, in the combination, a radiation sensor according to claim 18, characterized in that a plurality of sensor elements are formed above one cavity (Schieferdecker et al. '076, fig. 8 or '787, figs. 2-3 and 5, e.g.).

Re claim 23, in the combination, a radiation sensor according to claim 18, characterized by one or more of the following features:

the membrane material comprises a dielectric, particularly silica and/or silicon nitride (Schieferdecker et al. '787, figs. 2-3/51; '076, fig. 9/111, e.g.);

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under the membrane an etching stop layer containing an oxide, particularly silica, is provided (Schieferdecker et al. '076, fig. 9/113, 14, [0051], e.g.); and

the support material contains silicon and/or GaAs and/or a semiconductor material (Schieferdecker et al. '076, [0060], e.g.).

Re claim 24, in the combination, a radiation sensor according to claim 18, disclose following dimensions:

support height H: more than 50 μm , preferably more than 200 μm , less than 1,500 μm , preferably less than 600 μm (Schieferdecker et al. '076, [0024]; '787, col. 5, line 38, e.g.);

support edge length L: ~~less than 2 mm~~, preferably less than 1.5 mm (Schieferdecker et al. '076, [0008]; '787, col. 6, lines 10-13, e.g.);

cavity diameter D: ~~more than 55%~~, preferably more than 65% and/or ~~less than 90%~~, preferably less than 80% of the support edge length (Schieferdecker et al. '076, [0025], e.g.); and

membrane thickness D: less than 3 μm , preferably more than 0.1 μm ;
could be made in accordance with the provided dimensions and as reasoning in claim 1.

Re claim 25, in the combination, a wafer comprising a plurality of cavities for radiation sensors as in any one of the preceding claims formed on it, characterized in that the cavities are arranged on the wafer in a rectangular, rhombic, triangular or hexagonal grid (Schieferdecker et al. '787, col. 4, lines 15-28, e.g.).

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Re claim 26, in the combination, a sensor array comprising a plurality of radiation sensors according to claim **18** (Schieferdecker et al. '787, col. 4, lines 15-28, e.g.).

Re claim 27, in the combination, a sensor array according to claim 26, characterized in that a plurality of radiation sensors are arranged in two or more rows and in two or more columns (Schieferdecker et al. '787, col. 4, lines 15-28, e.g.).

Re claims 28-29 and 31-32, in the combination, a sensor module comprising: a radiation sensor according to claims 18 or 26, in addition to instant specification's page 9 that "standard housing" has a radiation window, the Tomonari et al. reference discloses in fig. 63 a housing 18R in which the radiation sensor is accommodated; an optical window in the housing; electric terminals protruding from the housing, said electric terminals being connected to the terminals; and an optical projection element, particularly a lens or a mirror.

Because it is known as standard, one of ordinary skill in the art at the time of the invention to provide the structure of the combination with known art housing with window and electric terminals protrudes from the housing.

Response to Arguments

4. Applicant's arguments filed 05/18/2011 have been fully considered but they are not persuasive.
5. In response to the footnote on page 7 or the Remark, the second Non-Final is not necessary because limitations of claims 31-32 are the same as in claims 28-29 which are addressed in the previous action.

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6. In response to limitations directed to Schieferdecker et al. '076, [0008], [0025], e.g. and '787, col. 6, lines 10-13, e.g.; those ranges/limitations, in additions to others, are the starting point(s) for one of ordinary skill in the art predetermines the end values/dimension of the formed sensor as stated.

Conclusion

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to THANH V. PHAM whose telephone number is (571)272-1866. The examiner can normally be reached on M-Th (6:30-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kimberly D. Nguyen can be reached on 571-272-2402. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/THANH V. PHAM/
Primary Examiner, Art Unit 2894

6/29/2011